

WHAT IS CLAIMED IS:

1. A field portable mass spectrometer system comprising:
 - a) an aerosol interface;
 - b) a sample transporter, the sample transporter interfacing with the sample collector to receive sample deposits thereon;
 - c) a time of flight (TOF) mass spectrometer, the time of flight mass spectrometer having a sealable opening that receives the sample transported via the sample transporter in an extraction region of the mass spectrometer; and
 - d) a control unit that processes a time series output by the mass spectrometer for a received sample and identifies one or more agents contained in the sample.
2. The field portable mass spectrometer system of Claim 1, wherein the aerosol interface comprises an inlet having a vacuum therein, the inlet collecting an environmental specimen containing one or more analytes.
3. The field portable mass spectrometer system of Claim 2, wherein the aerosol interface further comprises a nebulizer for injecting metered amounts of MALDI matrix particles into the environmental specimen prior to the inlet collecting the environmental specimen.
4. The field portable mass spectrometer system of Claim 3, wherein the metered amounts of MALDI matrix particles mixed with the one or more analytes contained in the environmental specimen form a spatially heterogeneous distribution of analyte and matrix.
5. The field portable mass spectrometer system of Claim 2, wherein the metered amount of matrix solution injected into the environmental specimen is adjusted in accordance with differing amounts of environmental background.
6. The field portable mass spectrometer system of Claim 2, wherein the aerosol interface further comprises one or more tape particle collector/impactor stations for collecting, concentrating and separating said one or more analytes contained in said environmental sample.
7. The field portable mass spectrometer system of Claim 1, wherein the sample transporter comprises a tape that receives the sample deposits from the sample collector, the tape

3 being received at the sealable opening of the mass spectrometer, thereby allowing a sample
4 thereon to be received in the extraction region of the mass spectrometer.

1 8. The field portable mass spectrometer system of Claim 7, wherein movement of
2 the tape when interfacing with the sample collector is independent of movement of the tape when
3 being received in the mass spectrometer.

1 9. The field portable mass spectrometer system of Claim 7, wherein the sample
2 transporter further comprises a first controllable motor that receives control signals from the
3 control unit and enables independent movement of the tape when interfacing with the sample
4 collector and a second controllable motor that receives control signals from the control unit and
5 enables independent movement of the tape when being received in the mass spectrometer.

1 10. The field portable mass spectrometer system of Claim 7, wherein the independent
2 movement of the tape is provided at least in part by a movable tensioner that interfaces with the
3 tape, the movable tensioner being interposed between the sample collector and the mass
4 spectrometer.

1 11. The field portable mass spectrometer system of Claim 7, wherein the tensioner is
2 a spring-loaded shaft and roller arrangement, the tape being wound around at least a part of the
3 shaft and roller components.

1 12. The field portable mass spectrometer system of Claim 1, wherein the TOF mass
2 spectrometer comprises a linear TOF mass spectrometer.

1 13. The field portable mass spectrometer system of Claim 1, wherein the TOF mass
2 spectrometer comprises a linear and/or reflectron TOF mass spectrometer.

1 14. The field portable mass spectrometer system of Claim 1, wherein the sealable
2 opening and the extraction region of the TOF mass spectrometer are provided in a housing
3 attached to or part of the TOF mass spectrometer.

1 15. The field portable mass spectrometer system of Claim 13, wherein the housing
2 further comprises a roughing vacuum chamber portion that connects between the sealable
3 opening of the housing to a vacuum valve.

1 16. The field portable mass spectrometer system of Claim 13, wherein the housing
2 further comprises a removable cover that is engageable with the sealable opening, the removable
3 cover and the sealable opening forming a vacuum seal when engaged.

1 17. The field portable mass spectrometer system of Claim 14, wherein a roughing
2 pump interfaces with the roughing vacuum chamber portion and serves to evacuate the roughing
3 vacuum chamber portion when (a) the vacuum seal is formed between the removable cover and
4 the sealable opening and (b) the vacuum valve is closed.

1 18. The field portable mass spectrometer system of Claim 14, wherein the vacuum
2 seal is provided by at least one o-ring in each of the removable cover and the sealable opening,
3 the o-rings engaging to form a vacuum seal when the removable cover engages the sealable
4 opening.

1 19. The field portable mass spectrometer system of Claim 15, wherein the cover is a
2 platen.

1 20. The field portable mass spectrometer system of Claim 14, wherein a surface of the
2 cover that covers the sealable opening comprises an electrode and defines one end of an
3 extraction region of the TOF mass spectrometer in the roughing vacuum chamber portion.

1 21. The field portable mass spectrometer system of Claim 16, wherein one or more
2 additional electrodes surrounding the roughing vacuum chamber portion and lying between the
3 sealable opening and the vacuum valve defines another end of the extraction region.

1 22. The field portable mass spectrometer system of Claim 19, wherein a vacuum
2 pump that interfaces with the main mass spectrometer vacuum chamber serves to evacuate the
3 main mass spectrometer vacuum chamber.

1 23. The field portable mass spectrometer system of Claim 20, wherein the open valve
2 between the mass spectrometer vacuum chamber and the extraction region forms part of the time
3 of flight path of the spectrometer.

1 24. The field portable mass spectrometer system of Claim 20, wherein the vacuum
2 pump that interfaces with the main mass spectrometer vacuum chamber serves to evacuate the

- 3 main mass spectrometer vacuum chamber and the roughing vacuum chamber when the valve is
- 4 opened, thereby providing a connected vacuum between the main mass spectrometer vacuum
- 5 chamber and the roughing vacuum chamber when the valve is opened.

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